THE ELECTRICAL SUPPLY IN THE NEW PSYCHOLOGICAL LABORATORY AT THE LELAND STANFORD, JR., UNIVERSITY.[1]

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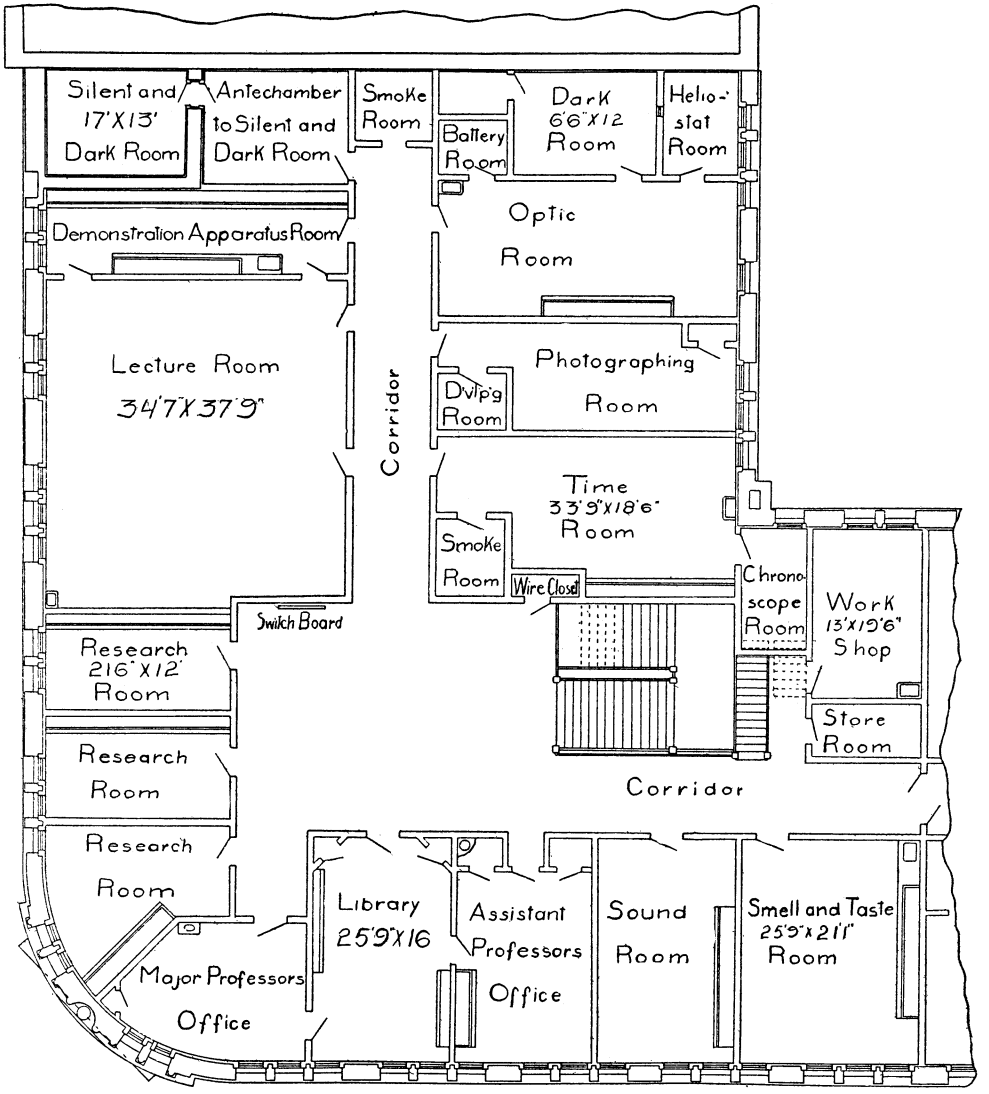
The Electrical Supply. During the construction of the laboratory it was wired for three different electric currents:

1. *The alternating current*, which is supplied to each room and closet for illuminating purposes, for making experiments with light, and for use with motors constructed for this particular current. (1) This current might also be employed with small direct current motors, but the abundant supply of more suitable currents makes its use for this purpose unnecessary in this laboratory. (2) Aside from the four clusters of bulbs for illuminating purposes, the lecture room is supplied with this current at five other points, making it possible conveniently to shift the stereoptical and other optical instruments to the place desired. The alternating current, through the use of a transformer, runs an induction motor which drives two direct current generators, and these furnish the direct current.

2. *The direct current.* The generators for producing this current are placed in the basement of the building and also supply electric power to the Physics Laboratory. The switches, etc., used in setting this machinery in motion are so easily manipulated that even an inexperienced person, as regards the handling of such machinery, is easily taught how to turn on and shut off the current as may be desired. There is one current with two outlets of 55 volts each supplied to each room of the psychological laboratory. In the lecture room there are four such currents placed in different parts of the room. Each current is admitted and shut off by a Lang switch

[1] PLAN OF THE PSYCHOLOGICAL LABORATORY.

Special rooms have been set apart for time, optical, sound and smell experiments only. The apparatus for other classes of experiments is placed in the cases in the research rooms and can be used in those or other rooms. Much of the apparatus used by the beginners in laboratory work has been duplicated and is stored in cases in the hall. All of the apparatus used for a given experiment is set out on a large table, which has been placed there for the purpose, and from this it is distributed. According to the original plan the smoke rooms, used for smoking drums, were to have been provided with flues for carrying away the superfluous smoke, but as yet these have not been put in.



PLAN OF LABORATORY.

which for purposes of protection is supplied with a fuse. The switch is mounted on a square board (see Fig. 2, B) on which the positive and negative poles are marked, and this is placed at the side of the room storage battery switchboard. When a suitable form as regards range of measurement and size of apparatus can be found, a rheostat for controlling the strength of the current is to be permanently mounted on each of these boards. At present the current is roughly controlled by a set of Scripture lamp-batteries with darkened bulbs, and more finely by connecting through plugs attached to the board one of the Rosenbach's rheostats made by Spindler and Hoyer of Göttingen (see Fig. 2, C). This current is for use when a current above 12 volts is required. It also supplies the current with which the storage batteries are charged.

3. *Storage and other battery currents.* Expense, awkwardness of manipulation, inconstancy and irregularity make the two previous currents unsatisfactory for much experimental work in the psychological laboratory. The laboratory has, therefore, been supplied with various forms of battery currents, as those generated by the storage batteries made by the Electric Storage Battery Co., by gravity batteries, by the Edison-Lalande batteries, by dry batteries, etc. The batteries are placed in the battery room, and through connection with wires running from this room to the general switchboard (see Fig. 1) the current or currents desired can be obtained in each of the rooms.

The general switchboard (made by the Drendell Switchboard Co., of San Francisco) also makes it possible to connect two or more rooms in circuit. For the ordinary purposes of the laboratory the storage battery is employed and the switchboard has been especially constructed with a view to its use, though any of the other batteries can be substituted for it should it be desired. The general switchboard is enclosed in a case having glass doors and is fixed to the wall in the hall, but for convenience of repair it has been so constructed that it can be reached from behind through doors in the wall in the lecture-room. The board is supplied with three storage battery currents, 1, 2, 3, having a voltage of 2, 6 and 12 volts respectively. The amperage of 1 and 2 batteries is 10 and of 3, 8 amperes. Current 1 is supplied by one element of the "Chloride Accumulators," manufactured by the Electric Storage Battery Co., of the type "E" with 5 plates, 7¾ in. x 7¾ in.; current 2 by connecting in series three of the same elements; and current 3 by similarly connecting 6 of the elements of the type "D" with 7 plates 6 in. x 6 in. By turning the arms of the switches V and A which connect the voltmeter a and ammeters b, b, b, with the various batteries on 1, 2 or 3, it is possible to determine the strength of the charge of that particular battery at

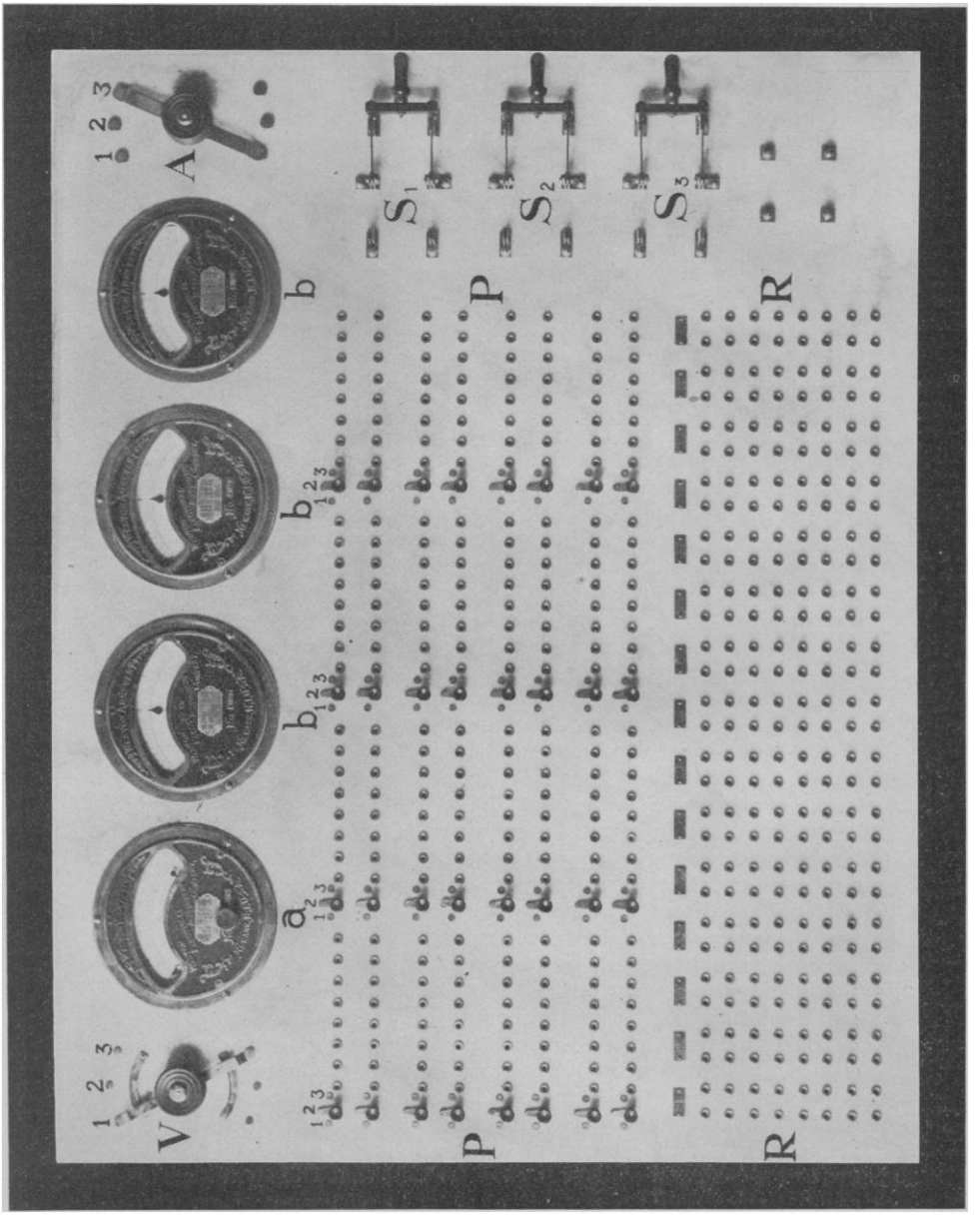


FIG. 1. LARGE SWITCHBOARD.

the moment, and should any battery need restoring to its normal strength, in order to avoid the injury that comes from allowing the battery to stand incompletely charged, this can be done by turning the arm of the switch A, on 1, 2 or 3, and reversing the switch S_1, S_2, S_3 which supplies the direct current to that particular battery. As regards the completeness of the charge in the batteries, the voltmeter acts as a danger signal. The current must not be allowed to fall below a certain voltage before being restored. In the renewing of the charge the ammeters show when the required charge has been reached. The voltmeter and ammeters on the switchboard give, of course, only the voltage and amperage of the current at the board. A portable voltmeter and ammeter is used for getting the current strength after it has reached the rooms and for finding the resistance offered by a given piece of apparatus. The arms of the small switches on the board in connection with one set of plug holes PP bring the particular currents desired to these different holes, and by connecting these holes through plugs with one or more of the pairs of holes RR of the sets of eight pairs of holes which belong to each room, it is possible to obtain eight currents in each room having a voltage of 2, 6 or 12 volts and an amperage of 8 or 10 amperes. Moreover, by proper plugging on the same board we may connect in circuit any or all of these rooms together in any way desired. Each room has a small switchboard (see Fig. 2, A) with holes corresponding to those on the large board for this particular room, so that no confusion regarding the particular current connected may arise.

The room switchboards make it possible, by connecting their terminals parallel or in series, and by introducing the Rosenbach rheostat, to obtain any voltage from the storage battery between a fraction of a volt and 20 volts. The current can also be reversed through using the switchboards. Should it be desirable to connect different rooms in circuit in using the direct current, the direct may be substituted on the general switchboard for the storage battery current. In that case, however, if the current was sent by but one wire to a room a resistance would have to be introduced, as the individual wires are too small for carrying the full current of 55 volts. Should it be desired for any purpose to put the full current of 55 volts in circuit, this could be done by dividing it by using the 8 pairs of wires belonging to each room. In that case, of course, no resistance would have to be inserted at the switchboard. As regards cost of the apparatus for supplying the storage battery current to the laboratory, it may be said that the switchboards and batteries and the putting of them in position cost approximately $1,500.

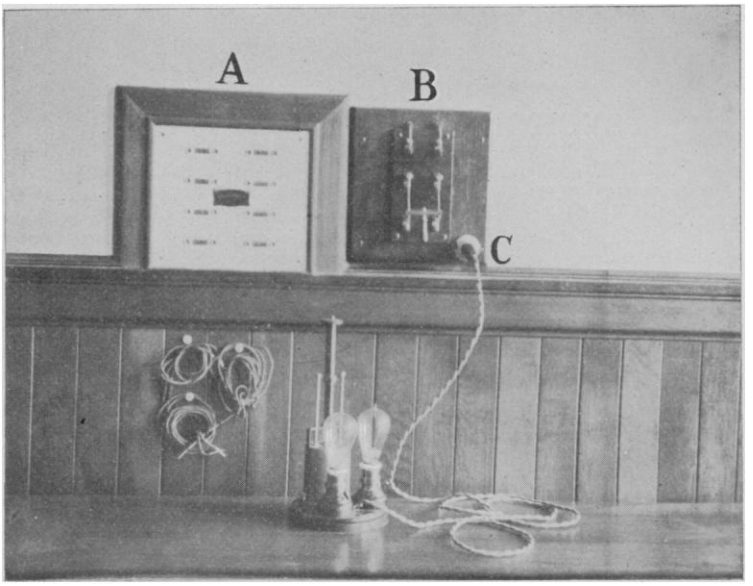


FIG. 2.

In what has been said an effort has been made to show that ten currents, varying in any strength desired from a fraction of a volt to 55 volts, are available at any time in each room of this laboratory. Indeed, we may say not 55 but 110 volts, for by a slight change in the connections with the generator this voltage can be obtained. It is evident that we have here not only the amount of electric current necessary to run the large motor of a workshop and the smaller motors used in color mixing and rotating kymographs, for holding the shutter of a tachistoscope, for the ringing of the signal bells, etc., etc., but a current that is sufficiently constant and regular to give accurate results when employed in the Hipp chronoscope and in time markers.